IN THE CLAIMS:

Please add new claims 54-69 as follows.

Sub E4

1-40. (Canceled)

41. (Previously Added) A method of processing data with a set of Turbo Codes derived from a universal constituent code, the method comprising the steps of:

encoding a signal at a first and second encoder using a universal constituent code, the first encoder and the second encoder each producing at least one parity bit; and

puncturing the respective at least one parity bit at each encoder with a puncturing pattern that provides a reduced signal-to-noise ratio loss.

D1

42. (Previously Added) A method according to claim 41, wherein the universal constituent code is a rate 1/2 constituent code having a transfer function: G(D) = [1, (1+D+D3)/(1+D2+D3)], where D denotes unit delay in presentation of data bits to an encoder.

43. (Previously Added) A method according to claim 42, wherein one of the puncturing steps comprises alternately puncturing parity bits between the first and the second encoder.

Sub E4

44. (Previously Added) A method according to claim 42, wherein one of the puncturing steps comprises transmitting all the parity bits at the first and second encoder.

45. (Previously Added) A method as claimed in claim 41, wherein the universal constituent code is a rate 1/3 constituent code having a transfer function: G(D) = [1, (1+D+D3)/(1+D2+D3), (1+D+D2+D3)/(1+D2+D3)], where D denotes unit delay in presentation of data bits to an encoder.

46. (Previously Added) A method according to claim 45, wherein each of said first and second encoder produce first and second parity bits; and

D1

wherein a rate ½ Turbo Code is formed by transmitting half of said first parity bits produced by said first encoder and half of said first parity bits produced by said second encoder.

47. (Previously Added) A method according to claim 45, wherein each of said first and second encoder produce first and second parity bits; and

wherein a rate 1/3 Turbo Code is formed by transmitting said first parity bits produced by said first encoder and said first parity bits produced by said second encoder.

48. (Previously Added) A method according to claim 45, wherein each of said first and second encoder produce first and second parity bits; and

Sub E4

wherein a rate ¼ Turbo Code is formed by transmitting said first parity bits produced by said first encoder, half of the second parity bits produced by said first encoder, half of said first parity bits produced by said second encoder, and the second parity bits produced by said second encoder.

49. (Previously Added) An apparatus adapted to perform the method of one of claims 41 to 48.

D1

50. (Previously Added) A method of processing data with a set of Turbo Codes derived from a universal constituent code, the method comprising the steps of:

encoding a signal at a first and second encoder using a universal constituent code, the first encoder and the second encoder each producing at least one parity bit; and

determining a sequence of bits output as a result of said encoding step to transmit that provides a reduced signal-to-noise ratio loss.

51. (Previously Added) A method according to claim 50, wherein the universal constituent code is a rate 1/2 constituent code having a transfer function: G(D) = [1, (1+D+D3)/(1+D2+D3)], where D denotes unit delay in presentation of data bits to an encoder.

Sub E4

52. (Previously Added) A method according to claim 51, wherein one of the puncturing steps comprises transmitting all the parity bits produced by each of said first and second encoder.

53. (Previously Added) An apparatus adapted to perform the method of one of claims 50, 51, or 52.

54. (New) A method of encoding signals, the method comprising:

generating a first set of parity bits using a constituent code based on received information bits;

interleaving the information bits;

generating a second set of parity bits using another constituent code based on the interleaved information bits, wherein the constituent codes are universally adapted to accommodate a variety of interleaver depths and Turbo code rates;

puncturing the sets of parity bits according to one of the code rates; and

outputting a coded signal based on the punctured parity bits.

55. (New) A method according to claim 54, wherein the constituent codes exhibit a rate of 1/2 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

Sub E4

56. (New) A method as claimed in claim 54, wherein the constituent codes exhibit a rate of 1/3 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3), (1+D+D^2+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

57. (New) A method according to claim 54, further comprising:

selecting a candidate system rate for the constituent codes;

evaluating performance of all possible Turbo code rates formed by the constituent codes according to a first interleaver depth and a plurality of test patterns;

determining a subgroup of candidate pairs of constituent codes, wherein other interleaver depths are applied to the subgroup; and

P1

determining the universal constituent codes from the subgroup yielding best performance for the interleaver depths.

58. (New) A computer-readable medium bearing instructions for encoding signals, the instructions, being arranged, upon execution, to cause one or more processors to perform the method claim 54.

59. (New) An encoder comprising:

a first constituent encoder configured to generate a first set of parity bits using a constituent code based on received information bits;

an interleaver configured to interleave the information bits;

Sub E4

a second constituent encoder configured to generate a second set of parity bits using another constituent code based on the interleaved information bits, wherein the constituent codes are universally adapted to accommodate a variety of interleaver depths and Turbo code rates; and

logic for puncturing the sets of parity bits according to one of the code rates, wherein a coded signal is output based on the punctured parity bits.

60. (New) An encoder according to claim 59, wherein the constituent codes exhibit a rate of 1/2 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

D1

61. (New) An encoder as claimed in claim 59, wherein the constituent codes exhibit a rate of 1/3 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3), (1+D+D^2+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

62. (New) An encoder according to claim 59, wherein a candidate system rate is selected for the constituent codes, and performance of all possible Turbo code rates formed by the constituent codes is evaluated according to a first interleaver depth and a plurality of test patterns, a subgroup of candidate pairs of constituent codes being determined, wherein other interleaver depths are applied to the subgroup, and the

Sub E4

universal constituent codes are determined from the subgroup yielding best performance for the interleaver depths.

63. (New) A method of decoding encoded signals, the method comprising:

receiving an encoded signal encoded by a Turbo encoder, a first set of parity bits being generated using a constituent code based on received information bits, a second set of parity bits being generated using another constituent code based on interleaving the information bits, wherein the constituent codes are universally adapted to accommodate a variety of interleaver depths and Turbo code rates, and the sets of parity bits are punctured according to one of the code rates; and

iteratively decoding the encoded signal to output a decoded signal based the universal constituent codes.

P1

64. (New) A method according to claim 63, wherein the constituent codes exhibit a rate of 1/2 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

65. (New) A method as claimed in claim 63, wherein the constituent codes exhibit a rate of 1/3 and have a transfer function of $G(D) = [1, (1+D+D^3)/(1+D^2+D^3), (1+D+D^2+D^3)/(1+D^2+D^3)]$, D denoting unit delay in presentation of the information bits for generation of the parity bits.

Sub E4

66. (New) A method according to claim 63, wherein a candidate system rate is selected for the constituent codes, and performance of all possible Turbo code rates formed by the constituent codes is evaluated according to a first interleaver depth and a plurality of test patterns, a subgroup of candidate pairs of constituent codes being determined, wherein other interleaver depths are applied to the subgroup, and the universal constituent codes are determined from the subgroup yielding best performance for the interleaver depths.

67. (New) A computer-readable medium bearing instructions for decoding encoded signals, the instructions, being arranged, upon execution, to cause one or more processors to perform the method claim 63.

D1

68. (New) A receiver for processing coded signals, the receiver comprising:

a Turbo encoder configured to encode a signal at a first and second encoder using a universal constituent code optimized based on a plurality of interleaver depths and Turbo code rates, the first encoder and the second encoder each producing at least one parity bit, the Turbo encoder being further configured to determine a sequence of bits to transmit based on the universal constitute code; and

a modulator configured to modulate the sequence of bits according to a predetermined modulation scheme.

69. (New) A receiver according to claim 68, wherein the modulation scheme includes one of a Code Division Multiple Access (CDMA) and Time Division Multiple Access (TDMA).